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B.S.I. and Business

It is not difficult to appreciate the attitude of some works' executives when called upon to participate in the preparation of British Standard Specification, when it affects a line of manufacture in which they are particularly interested. They feel that the issue of a standard devaluates the worth of their trade marks, on which they have spent so much money publicising. The sales side imagine that it will be most uninteresting selling B.S.I. 57,635 instead of the "Flummax" brand to which they have devoted so much research time and energy. Yet the march of progress demands the institution of standard specifications, because of the sense of security they give to the buyer. Before the war, foundries were receiving inquiries for street lamp standards to be made according to a B.S.I. specification, which called for a construction competitive with castings, so steps had to be instituted to provide a new specification covering iron castings for this use. Again, an order received from one of the Dominions for a power plant specified the great majority of materials to conform to B.S.I., but for certain components American specifications were cited. This makes a poor showing from the viewpoint of national prestige, and consequently new standards had to be envisaged. Only last week we dealt with the attack which had been made on the American malleable-iron castings industry by an official of the supply services, based on its lack of "aggressiveness." A number of well-thought-out official specifications, designed to represent good practice and not something the worst organised shop in the industry can meet with a good margin to spare, is a pre-requisite of modern industrial salesmanship. It is not thus merely necessary to create a specification and then fall asleep, but there must be constant vigilance to ensure that the requirements are stepped up to keep pace with research and technical progress. This has been done with iron castings, but there are other cast products demanding immediate revision if industry is to be presented with a proper picture of their capabilities. We suggest that malleable-iron castings enter into this category. We are fully aware that there are two committees considering the situation and that the personnel is drawn from the best brains in the malleable industry, and, moreover, they have many other problems confronting them. Yet we ask those responsible, in the light of preparing for post-war activities, to give this subject their earnest and immediate attention. Because the buying authorities are so thoroughly wedded to standardisation and it becomes apparent that it may not be merely one individual firm which is passed over for an order covering nation-wide requirements, but a whole industry, just because of the non-existence of a specification or the failure to step up an existing one. Thus, for instance, it is of paramount importance to our industry, to ensure that such hypothetical publications as "The Post-War (Emergency) Schedule of Permissible Building Materials" contain as many entries as possible specifying cast products. The committees which supervise the creation of such regulations will naturally take cognisance of what is disclosed by the B.S.I. specifications germane to each item being studied. The war has made the foundry industry "specification-minded," and now being familiar with every aspect of the work, it is our duty to see that the best use is made of the great potentialities of B.S.I. specifications for increasing business. It must be borne in mind that the War-time Building Regulations, which certainly do not favour castings because of metal shortages, are likely to form the basis for immediate post-war activity, and vigilance will be required to ensure rapid modifications with changing conditions.

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FOUNDRY INQUESTS—II

By "CORONER."

Wasters are occasionally the result of very simple and often overlooked causes. Fig. 1 is a typical example in which is shown the top part of a fairly complicated cylinder casting, the lower part of which carried the bores, valve ways, ports and water jackets. The portion illustrated is the top half of the crank-case, which is cast integral with the cylinder. Inspection doorways A are provided at each side. The trouble experienced was "gas-holes" on the face B. These were not revealed until the skin had been broken, either by a sharp pointed pick or, more often, after the first cut had been taken in the machine shop. The casting was poured in the position shown, being run by a combination of top and bottom runners. The cores forming openings A were placed in points

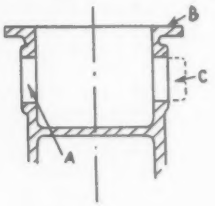

FIG 1

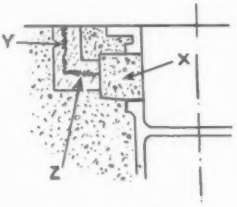

FIG. 2

C and were made of a sea-sand mixture. On experiencing trouble, metal temperatures were checked and the running system overhauled, but results were still bad. Eventually it was thought that the trouble might be emanating from the cores A, as it was discovered no means of taking the gas from them were provided, and thus the gases evolved on casting were being trapped on the flange B. To rectify this a freer core was used and vented through the side of the mould, as shown in Fig. 2, where X is the core and Y the space left from a piece rammed up in the mould. This is connected to the print for X by a channel Z. On assembly the spaces Y and Z are filled with fine ashes, and thus easily conduct the gases away from the core X and avoiding trapped gas on flange B, Fig. 1.

High Conductivity Copper Castings.—One morning we happened to read two practical articles on this subject, the one emanating from South Africa and the other from America. The recommendations given are so divergent that we print them side by side:—

South Africa.	**U.S.A.**
Casting temperature, 1,115 to 1,200 deg. C.	1,315 deg. C.
"Large castings as cool as possible,"	"or higher if possible."
Deoxidiser, 1 oz. of Mg per 100 lbs.	3.2 ozs. of 15 per cent. of phosphor copper per 100 lbs.

MEASURING SURFACE SMOOTHNESS

At a recent meeting of the Measurements Section of the Institution of Electrical Engineers, Dr. E. H. Rayner gave a lecture on "Measurement of Small Quantities," in which he referred to the gauging of surface smoothness and its application in rolling-mill practice. For measuring the degree of smoothness of surfaces Dr. Tomlinson, of the N.P.L., had developed an instrument in which a stylus with a radius of about 1/10,000th in. was drawn slowly over the surface and, by a light magnifying lever motion, made a record of its vertical travel above or below the general level of the surface, on a disc of smoked glass. The magnification was about 160 times, but it could be further magnified by a projection microscope 50 or 100 times, making a total of 1,600. Taylor, Taylor & Hobson, Limited, of Leicester, have developed an instrument of a similar character which would record in ink the contours of surface irregularities with variable magnification up to 40,000 times.

The same principle, with a much more robust type of mechanism, has been applied to the more ordinary types of thickness and diameter measurements, having a sensitivity of 1/100,000th in. A notable application was to the control of the thickness of thin sheet passing through five rolling mills in succession without stopping. The operator had the instruments in front of him; these continuously indicated the thickness of the sheets and he could adjust the pressure of the rolls accordingly.

BOOK REVIEW

Relief Deliveries and Relief Loans, 1919 to 1923. Published by the League of Nations and obtainable from Allen & Unwin, 40, Museum Street, W.C.1. Price 3s. 6d.

This book reveals that most of the relief effected under Mr. Hoover's administration after the last war was not charity, but was supplied against I.O.U.s carrying 5 per cent. interest. But actually only 3½ per cent. of the debt incurred has been repaid. During the armistice period only 0.4 per cent. was charity, whilst 32 per cent. was paid for in cash. Later, including the profit made on the transactions which were ploughed back, the charitable end of the relief reached 18 per cent. It appears that the payment of relief in cash and by credits, so crippled some countries from the economic aspect that it was a major cause of later inflation. This book is a timely production, as it points the way to the avoidance of the mistakes which were made in 1919. Elementary arithmetic is used to show that by the judicious free distribution of a part of Government surpluses, an actual profit can be made on the balance of the stock held, whereas by holding the whole of it, very serious losses would be entailed by loading on to the market at "give away" prices. The book carries many dull and a few very interesting tables. The importance of the book cannot be overstressed, especially as it marries relief with post-war reconstruction.

V. C. F.

THE CONTRIBUTION OF THE STEEL FOUNDER TO MARINE ENGINEERING

Sixth Edwards Williams Lecture to the Institute of British Foundrymen

By STANLEY FABES DOREY, D.Sc., Wh. Ex., Chief Engineering Surveyor to Lloyd's Register of Shipping

Following an introductory section dealing with the history of steelmaking and Admiralty investigations on the employment of steel castings in place of forgings in shipbuilding, Dr. Dorey, in his Edwards Williams Lecture, gave a review of some examples of marine castings, tests for marine steel castings, engineering applications, ship's machinery, the prohibition of chilling bars by Lloyds, and the problem of co-operative research in the future. These sections are reported in extenso below.

In a ship, the stem, the sternframe, propeller shaft brackets and rudder frame come first to mind. These are vital parts of a ship's structure, subjected to considerable loads arising from vibration and bending forces when in service. In the case of large ships, these parts may be built up from individual castings of considerable weight, some well over 100 tons in the cast condition, and a modern steelfoundry must be equipped with the means for handling such heavy components.

As examples, photographs of some of the castings for the Q.S.S. "Queen Mary" are shown in Figs. 1 to 4.

FIG. 1.—MAIN PIECE OF STERNFRAME BEING STRIPPED READY FOR ANNEALING

Fig. 1, the main piece of sternframe in process of stripping. This casting weighed 110 tons.

Fig. 2, the trunk piece of sternframe being stripped, a casting of 90 tons weight, and a core diameter of 50 in.

Fig. 3 shows the completed sternframe assembled and laid out in the machine shop. This huge cast-steel structure formed a composite casting of total weight nearly 200 tons.

In addition to the foregoing, the cast-steel stern components also included propeller shaft brackets. Each inner shaft bracket weighed 60 tons, and the two outer shaft brackets, shown in Fig. 4, comprised a total finished weight of 180 tons.

These examples, together with corresponding parts for the "Queen Elizabeth," represent the largest marine steel castings ever made (probably the largest that ever will be made); nevertheless, it must not be thought that heavy steel castings are entirely a modern development. For instance, the cast-steel sternframe for the old White Star liner "Oceanic," built as long ago as 1899, and wrecked during the last war, was made, as in the case of the "Queen Mary," by the Darlington Forge Company, and had a finished weight of 76 tons.

Examples of heavy steel castings made on the Continent are shown in Figs. 5 and 6. Fig. 5 shows the inboard propeller shaft brackets for the French liner "Normandie." Each bracket weighs 57 tons, giving a total weight for the inboard brackets alone of 114 tons.

Fig. 6 shows the cast-steel rudder for the same ship, a casting of 125 tons weight.

These two illustrations are of special interest, showing that facilities exist, or did exist, on the Continent for the production of such large and heavy castings. These castings were made at the Skoda Works in Czecho-Slovakia, and similar castings for the crack German liners "Bremen" and "Europa" were also made at these works. In this country, it is satisfactory to know that just as large and intricate steel castings can be produced in British foundries.

Sixth Edwards Williams Lecture

Apart from these main structural components, many other items of a ship's equipment are now made in cast steel. These include such important details as anchors and chain cables—the latter being a good example of ingenuity in the founder's art. In recent years, however, the cast-steel anchor cable has had to give pride of place to the resistance welded steel cable, though a number of foundries still produce them, chiefly in America. Other items are, windlass cable lifters and hawse pipes, both of which have to withstand very heavy duty, steering gear quadrants and tillers, on which the safety of the entire ship depends, watertight doors and frames, mast caps, derrick mountings and numerous other details for which strength and toughness are essential qualities.

In the present war, in which enemy strategy has been so largely directed towards the destruction of Allied shipping, cast steel has been called upon to give even greater service in the construction of parts and fittings which have to withstand the shock of underwater explosions. Valves and fittings which are directly connected to the ship's hull, stern tubes, the bedplates and framework of deck machinery, bulkhead fittings, etc., have all been found extremely vulnerable to explosive shocks when made in cast iron. In most cases, cast steel and welded mild steel have pro-

FIG. 2.—STRIPPING TRUNKPIECE OF STERNFRAME.

FIG. 3.—COMPLETE STERNFRAME OF NEARLY 200 TONS.

vided the solution, the choice between the two being mainly a matter of economics.

Tests for Marine Steel Castings

With this in mind, it is interesting to recall that it was primarily in regard to its resistance to shock that most doubts were expressed when cast steel was first put forward for the approval of the authorities about 1880. The Chief Surveyors of Lloyd's Register of Shipping at that time were instructed by the Society to look into the whole question of suitable tests to prove the soundness and consistency of this new material. They were not without some experience of the use of cast steel in service. Stems and sternframes, and even crankshafts for reciprocating engines, were already fitted in a few ships running in the North Atlantic, and giving satisfactory service. These had been accepted by Lloyd's Register of Shipping on a tentative basis. In this connection it is sometimes forgotten that a Classification Society bears a special responsibility in its acceptance of new methods of construction and new materials, and far from acting as a bar to progress, the Society are able to apply a judicious brake which ensures a careful and rational development based on a study of the results of tests and experience in all parts of the world. Thus it has always been the practice of Lloyd's Register of Shipping, and never more so than it is to-day, to give tentative approval to new processes and new ideas and to encourage their development as experience is acquired.

In regard to these early uses of cast steel, there had, of course, been some failures. Cracks occurred which threw suspicion on the shock-resisting property of the material, and in 1882, as the result of their investigations, Mr. Benjamin Martell and Mr. William Parker, the Chief Ship and Engineer Surveyors to Lloyd's Register of Shipping, recommended a percussive test for cast steel stems, sternframes and rudder frames. The test was to take the form of dropping the article on to hard ground, thereafter it was to be carefully examined and pounded with a hammer.

In 1885 an Admiralty Committee investigating the use of cast steel for marine purposes, and taking into account the experience already gained in the Merchant Service, recommended the adoption of acceptance tests for this material similar to those required by Lloyd's Register of Shipping. These tests included a percussive, or drop, test which is still used to-day for cast-steel sternframes, rudders, steering quadrants, crossheads and tillers, and anchors, in addition to the usual tests for tensile strength and ductility. At the discretion of the Surveyors, however, the percussive test may be omitted in the case of castings of complex design, additional tensile and bend tests being substituted.

It is fair to say, in the light of present knowledge, that early failures of steel castings were more likely due to faulty design and incorrect foundry practice, and heat-treatment, than to any inherent defect in the quality of the cast steel. Parker instanced a case of a cast-steel multi-collar thrust shaft in which fractures developed at the junction between the thin section collars and the heavy body of the shaft. It was claimed that had the shaft been cast as a solid mass, and the collars subsequently machined out of the body, the fractures would not have occurred. The problem of the junction between thin and heavy sections, and the correct positioning of feeding heads, still gives rise to considerable anxiety in the foundry even to-day.

Engineering Applications

Turning now to the use of cast steel for essentially engineering purposes, a very wide field of application at once becomes apparent. Once the superiority of mild steel over iron had been established it was a natural development to substitute cast steel for cast

FIG. 4.—CAST STEEL OUTER SHAFT BRACKET.

Sixth Edwards Williams Lecture

iron, and also, in many cases, for wrought-iron forgings. Enthusiasts in those early days visualised the total extinction of forgings both in iron and steel, and there were many arguments regarding the relative merits of forged mild steel and cast steel. There can be little doubt to-day that, with modern foundry equipment and heat-treatment, it would be difficult to decide which was the superior material for many particular purposes. In this connection, one of the latest developments is the manufacture of cast-steel gear wheels for ship propulsion, in which the helical teeth are cut direct in the periphery of the steel casting, thus dispensing with the more usual forged-steel rim.

The introduction of mild steel for boiler construction led to a rapid increase in working steam pressures and temperatures. Whereas in 1875 the common steam pressure in boilers was 60-65 lbs. per sq. in., within ten years many boilers were made to work at 150 lbs. per sq. in., and with further improvements in workmanship pressures of 180 lbs. per sq. in. rapidly came into use.

For such pressures and saturated steam temperatures, which would nowadays be considered very moderate, ordinary cast iron was quite suitable for valve chests and fittings mounted on the boiler. With the introduction of superheated steam, however, a number of failures of cast-iron fittings focussed attention on the question of the use of this material for higher temperatures. Research work was carried out, notably by H. F. Rugan and Sir Harold Carpenter, who in 1909 put forward the results of their investigations into the effects of temperature on cast iron, in a Paper read before the Iron and Steel Institute. As the result of these and other investigations it was generally agreed amongst manufacturers, users and inspecting authorities, that the use of cast iron should be restricted to saturated steam temperatures in the neighbourhood of 400 deg. F. In 1920 Lloyd's Register of Shipping regularised what had by then become general practice by prohibiting the use of cast iron for steam temperatures above 425 deg. F., and stipulated that cast steel, or other approved material, was to be used for temperatures higher than that figure in vessels classed with the Society.

Here then was a valuable contribution from the steelfounders to engineering progress. The entire development of higher steam temperatures, and the boilers and machinery associated therewith, depended upon the production of a suitable material which would exhibit sufficient strength under the combined effect of stress and high temperature. It is beyond question that without cast steel such engineering progress would have been retarded. To-day there are special types of forced circulation boilers working at steam pressures not of 180 lbs. per sq. in., but at ten times that figure, whilst superheat temperatures approach 1,000 deg. F. These thermal conditions call for special creep resisting steel for tubes, headers, pipes, valves, and other fittings, and it is satisfactory to note that the steelfounder can produce suitable castings in whatever material may be required.

(To be continued.)

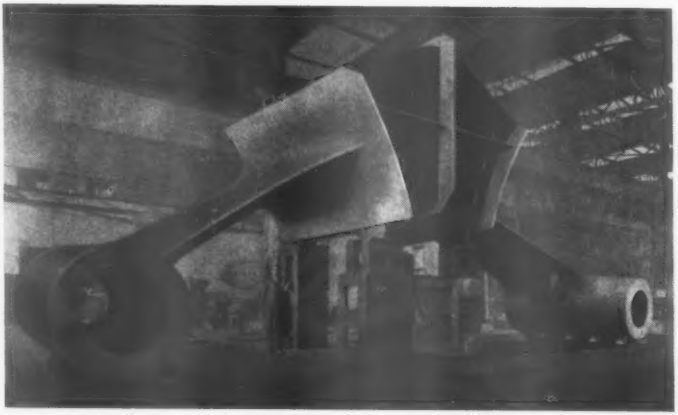

FIG. 5.—INBOARD PROPELLER SHAFT BRACKETS.

FIG. 6.—CAST STEEL RUDDER.

MIDLAND IRONFOUNDERS' ASSOCIATION

COUNCILLOR HURST ON POST-WAR ACTIVITIES

At the recent annual meeting of the Midland Ironfounders' Association, the chairman (Councillor A. E. Hurst, J.P.) said that the meeting this year was much overdue, but it had been delayed so that, if possible, the Committee could report the completion of matters of considerable importance to members. The Midland Ironfounders' Association was founded in 1936, with a membership of 22 firms. On December 31 last the membership totalled 165, and to-day it was the largest area association in the country. In the fourth year of the war, ironfounders had, of necessity, to grapple with many difficult problems, but the most serious was the decision of the Board of Trade to concentrate the industry.

Although it had been officially announced that if and when the Board considered it desirable in the national interest that concentration should be applied to any industry, the industry should have an opportunity to prepare and submit its own scheme for the Board's approval, yet, in the foundry trade, the Board intimated without any warning or consultation that certain foundries in London and S.E. district would be given nucleus status, and others would be closed down, and these must make arrangements with the nucleus firms to produce their castings. As a natural consequence of official plans being put forward without any consultation with those engaged in the industry, there was a good deal of muddle and confusion, and the scheme had to be considerably amended, and recently some of the closed firms had been allowed to re-open their foundries.

As a result of this experience, the Board submitted their proposals for the Midland Region to the C.F.A., who it had been agreed should act for the industry in concentration proposals for other areas. The scheme for the Midland Region was sent to the C.F.A. late in August, with the request that any objections or suggested alterations should be sent to the Board by September 7. As there were nearly 400 firms covering the five West Midland counties, divided into 18 groups, this was clearly impossible, and it was only after weeks of very hard work that the Area Concentration Committee presented their report to the Board of Trade at the end of October, and a deputation attended in London to deal with any objections the Board might raise to the Committee's recommendations. After the decision to exclude the malleable trade from the scheme, and the Committee's efforts to meet the Board's requirements in every way possible, there was a very small percentage of the foundries in that area that could be closed down if Government requirements for castings were to be met. For example, it was found that the nucleus firms who were to take over the closed firms were themselves buying outside their own foundries over 600 tons of castings per week. Following the Midland Region results, and a similar condition being found to apply in the Northern districts, it was decided to abandon concentration, and notice to this effect was received at the end of February.

Fuel Committee

With the approach of winter, and the increasing demands of munition factories, the country was confronted with a coal crisis, and it was apparent there must be economies effected in the consumption of fuel in every direction. The output of coal showed an alarming reduction compared with pre-war. It was considered desirable the industry should set up its own fuel committee so that, if curtailment or allocation of fuel supplies had to be applied to foundries, better results would be obtained if the matter were handled by those who understood the varying needs of the foundry industry, than if the problem was dealt with by Whitehall.

Accordingly a special Fuel Committee was set up in October by the C.F.A. Thirteen Regional Panels had been established, and with the co-operation of the Technical Committee of the Institute of British Foundrymen, and the British Cast Iron Research Association, the whole scheme was now working to the satisfaction of the Ministry, reported the chairman.

The Committee has given constant and careful attention to the problems of supplies of materials, withdrawal of labour, railway classification, demurrage and standage proposals, selling price increases to meet increasing costs of wages and materials and, in these and many other matters, the Secretary has given much time and thought to assist members in the difficulties they have had to meet.

A scheme for the training of apprentices for the ironfounding industry and the general education of youths engaged in the industry is also under consideration by a committee, including representatives of the Institution of Mechanical Engineers, the Institute of British Foundrymen, the British Cast Iron Research Association, and the Engineering and Allied Employers' National Federation, and a committee has also been set up by the C.F.A. in an endeavour to establish a set of costing principles which can be recommended to the industry as a whole, and which can, perhaps, be adapted to the various fields of production.

The Future of Control

The air is full of post-war reconstruction plans and proposals. It will be remembered the C.F.A. is now recognised as the organisation to speak for the industry in its relations with Government department as and when it may be necessary. Recently it has appointed a Development Committee with a view to a more complete organisation of the foundry industry, and submitted a draft report which contemplates activities on a very much wider basis than its original purpose and policy. The Report has been referred back for re-drafting, and members will have to consider, when that has been done, whether the elaborate and expensive organisation suggested is necessary or desirable, and whether the complete autonomy of each Association would be restricted by the suggested re-organisation. The cost is estimated to show an increase to

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STORING PLATE PATTERNS

BY "CHECKER."

The storing of plate patterns is of considerable importance, especially as the cost of some of these patterns can be very expensive. When they are not in use it is better to have racks in the pattern stores, or at one end of the moulding shop, in which the smaller plates can be kept until required, and so eliminate breakage and damage by contact with other equipment. These racks can be made at small cost from strips of rough wood approximately 2½ in. by ¾ in. or 2 in. by 1 in., the ends, top, bottom and down partitions all being made in skeleton form, with three

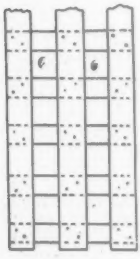

FIG. 1

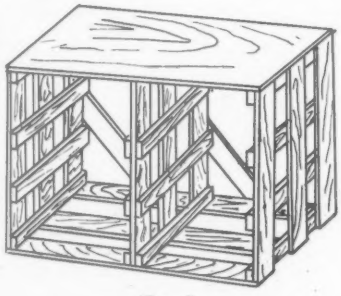

FIG. 3

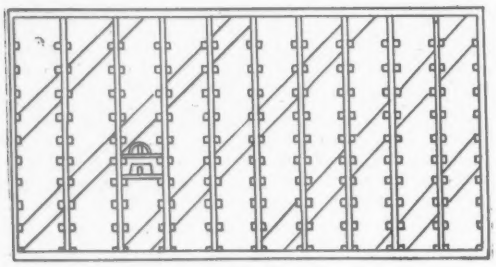

FIG. 2

pieces of wood as shown in Fig. 1, the down-pieces being battened together at intervals as shown. These battens should be placed square across at correct intervals, as they have a double purpose; they hold the down-pieces together and act as ledges for the plates to slide on while leaving sufficient room so that one plate will not foul the one above or below it. Fig. 2 shows the front view of the rack with two plates in position, the inclined pieces at the back are secured to act as battens, and hold the complete rack firm and rigid; the partitions should be wide enough to

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MIDLAND IRONFOUNDERS' ASSOCIATION

(*Concluded from page 7.*)

approximately six to seven times the present expenditure of the C.F.A., if the cost of the Fuel Committee be included.

That there will be a continuation of Government control for some months after the war seems inevitable, and there will be a real need for the industry to be organised as completely as possible through the district associations and with the C.F.A. acting for the industry in all matters relating to Government action, but probably members need not have any anxiety about its supplies of materials or labour. The building of houses by the 100,000 will have to be a first priority, on the one hand, and on the other export trade will be more important than ever; and as vast quantities of castings will be required for both, the Government, of necessity, will have to assist the industry in every way they can.

In any case it will be agreed that, if a ruined and devastated Europe and a similar state of things in vast parts of the Far East requires that the Government shall control the course and direction of industry for some time after the war, the carrying out of that policy shall be in the hands of industry itself, and the stranglehold the bureaucracy has obtained over every department of industry shall be removed in a matter of months, and that can only be done if industry is 100 per cent. organised and in a position to speak to the Government on equal terms with the T.U.C.

Net earnings of the American Car & Foundry Company in the fiscal year ended April last amounted to $5,055,719, after all charges, equal to $5.05 a common share, and compares with $9,275,877, or $12.09 a common share, in the preceding year, states the president of the company in the report to stockholders. During the year the company and its subsidiaries produced increasing quantities of combat tanks, armour plate, shells, bombs, buses, valves, metal containers for the transportation of chemicals, mine-sweepers, lighters and other vessels for naval use, besides an infinite variety of miscellaneous supplies.

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allow ¼-in. to ⅜-in. clearance for the plates to be easily placed in or taken out of the racks.

For small plates it will be found that the racks can be made to hold plates numbering 10 to 12 in height, and the length can be determined according to the number required to be stored, and the space available. It is also advisable, if space permits, to have smaller racks near the moulding machines holding about six plates, for patterns that are in constant but not continual use. These could be made as shown in Fig. 3, and should be on similar lines to the larger ones, but with a solid top so that they can be utilised for other purposes.

SOME ASPECTS OF THE PRODUCTION OF MALLEABLE IRON CASTINGS

By J. ROXBURGH, A.M.I.Mech.E. (Member)

Paper read at the Fortieth Annual Conference of the Institute of British Foundrymen

(*Continued from page* 345.)

Metal Behaviour during Cooling

In the perusal of literature, published over a lengthy period, it is significant to observe the attention which has been devoted to the study of the behaviour of all types of metal in cooling down from their liquid to their solid state, with particular interest for the foundrymen in regard to such metals, when poured into some mould or other, whether it be sand or chill. With all types of metal when cast into any definite shape in some kind of mould, shrinkage is liable to occur.

There are three kinds of shrinkage, entirely different, and occurring at definite stages in the cooling of a metal from its highest to its lowest temperature. During the first stage in cooling, from its highest temperature to its initial freezing point, 'volume contraction' of the liquid metal takes place, which is a definite constant amount for each degree Centigrade fall in temperature. The second shrinkage occurs in changing from the liquid to the solid state, and is usually termed 'liquid shrinkage.' When solidification is complete, after thus having passed through its 'freezing range,' in cooling down to normal temperatures, another shrinkage takes place, known as 'solid contraction.' These phenomena are well known, but the author offers no apology for their repetition because of their importance.

Phase diagrams are fundamental in the study of the behaviour of all metals and alloys in their cooling down from the liquid to the solid state. In order to be able to cast a metal or alloy into a mould, a degree of superheat must be imparted to it, *i.e.*, a sufficient heat to raise its temperature considerably above its initial freezing point. When cast, the metal, other than eutectic alloys, cools down to its initial freezing point and remains a mixture of liquid and solid crystals, for a certain period, referred to as 'freezing range,' until it is solid. The initial freezing point and the freezing range are determined essentially by the composition of the metal or alloy. During this freezing range shrinkage takes place (the liquid shrinkage referred to previously), forming voids, cavities or unsoundness in the metal. This fundamental knowledge in regard to steel and non-ferrous materials can usually be illustrated by phase diagrams, but with white and grey cast irons, due to their greater impurities and multiplicity of compositions, indications of subsequent behaviour can only be forecast approximately or postulated as a result of previous experience with some particular composition of metal.

When considering the processes associated with the manufacture of castings, design, mass, differences in section, composition and temperature of metal, and mould materials, all exert their influence on the behaviour of the metal during cooling. It is the con-

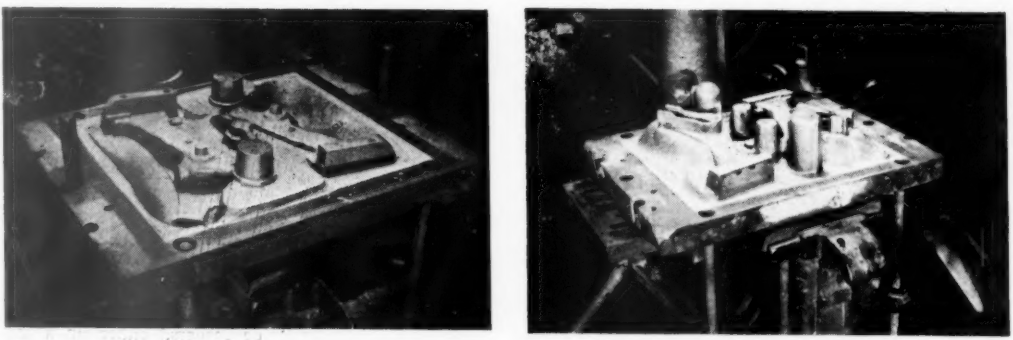

FIG. 6A.—TWIN PATTERN PLATES FOR AGRICULTURAL CASTINGS.

Malleable Iron Castings

stant aim of the manufacturer to control or direct the solidification of the metal, so that appropriate measures may be adopted to produce a sound casting. It is obvious that the last portion of a casting to solidify, if no provision were made for additional metal to be 'fed' into it, would present 'draws,' 'sinks,' or 'unsoundness.'

In order to take care of this 'liquid shrinkage' and to promote the soundness required in a casting, it is essential to provide a reservoir of hot metal from which the casting can draw to fill up the cavities or unsound portions which would otherwise result. Where thick and thin sections occur in a casting, the difficulties of 'feeding' are increased, particularly if the thick sections of the casting, due to the method of

FIG. 6B.—COPE AND DRAG FOR AGRICULTURAL CASTINGS.

moulding adopted, are so placed in the mould as to render them difficult of accessibility. It is preferable, if possible, when moulding, to arrange for the thick section to be above the thin section, so that the thick section can feed the thin section, whilst the thick section can itself be made sound from a reservoir of metal. It often happens, however, due to the vagaries of design, that thick sections occur at various points of the casting, causing further complications due to the difficulty of arranging for the provision of additional metal to ensure their soundness.

It will be recognised then that each individual casting has its own peculiar characteristics with regard to liquid shrinkage, and the necessary measures must be devised to overcome the defects which would result from this cause. It is often possible, due to the happy relations which exist between customer and manufacturer, for a design to be altered in its initial stages, to assist the manufacturer to produce a sound casting.

Variety in Feeder Types

There are many types of 'feeders' in general use, and they vary in shape and size, dependent on the type of metal used, the design of the casting and method of moulding. They differ, too, in their disposition relative to the casting, some being attached to the casting on the top or highest point, some on the side or on some other pre-determined position, according to the location of the different sections of metal, or on the joint or joints of the mould. The direction of solidification of each individual casting must definitely be studied before the final determination of the disposition of feeders and gates in relation to the casting. In the control of such direction of solidification of the metal in the casting, the sections of metal themselves, the heating or cooling of the metal due to the materials forming the mould, have important influences.

There will be found therefore in general practice what are known as 'top feeders,' on the top or high

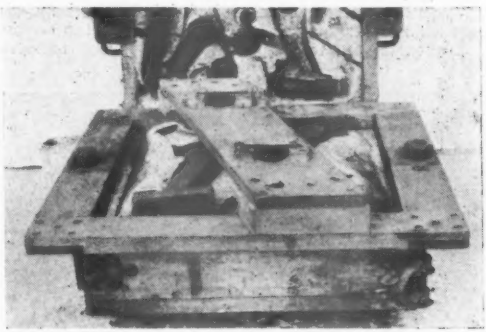

FIG. 6C.—DRAG, SHOWING JIG USED TO CENTRALISE CORES, FOR AGRICULTURAL CASTINGS.

points of a casting, 'side feeders,' either on a joint of a mould, where they may be 'blind' or brought through the upper part of the mould, or situated in some other part of the mould, apart from the joint, and brought through the cope. These types can again be sub-divided into what are termed 'running feeders' and 'off feeders.' The distinction between them is that with the former, metal is run into the feeder and through it into the casting, whilst with the latter the metal runs out of the casting into the feeder. A running feeder, therefore, usually keeps molten for a longer period than an off feeder, and, where practicable, the former is preferred to the latter, although in exceptional cases an off feeder may give the desired result. A feeder is essentially a reservoir of metal, which should remain in its liquid condition until some time after the casting has solidified, thus ensuring that, up to the point of solidification of the casting, the latter has been able to draw the required liquid metal from the feeder to ensure the soundness of the casting.

Some types of feeders undoubtedly dissipate their heat too rapidly, due to the surface area exposed to cooling by virtue of their shape and, in addition with top feeders, to their exposure to the atmosphere; they are therefore rendered prematurely solid, preventing the completion of their function. In order to retard this rapid dissipation of heat and to retain the metal in a liquid condition and at as high a temperature as possible for the requisite length of time for successful feeding, a shape of feeder should be so designed that the surface area is a minimum for the volume of metal deemed necessary, and this bulk of metal should be concentrated where it is required.

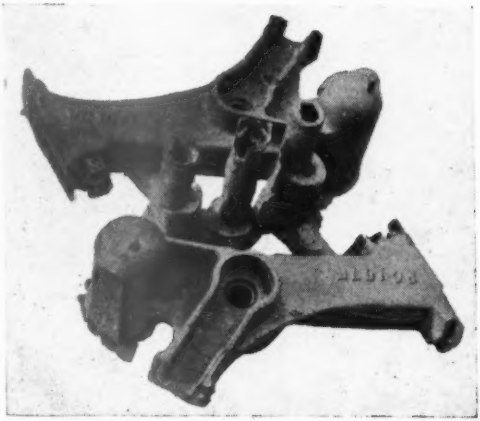

FIG. 6D.—AGRICULTURAL CASTINGS, WITH FEEDERS AND RUNNERS ATTACHED.

Taylor and Rominski on Feeding Castings

It was therefore with very great interest that the author studied the Paper "Utilising Atmospheric Pressure and the Steel Casting."[3] published by Taylor and Rominski; he takes this opportunity of paying tribute to their work and for the information they have given to the foundry industry in regard to that most important aspect of foundry practice, *viz.*, the feeding of castings. Their work deals exclusively with steel castings, and the author realises that, due to steel having a higher casting temperature and a shorter freezing range than malleable iron, it would exhibit a different 'mechanism of solidification' than the latter when cast into a mould. For this reason, he would not presume to discuss their work in detail, but would take the opportunity of reporting his experiences gained in the feeding of malleable castings. The author's experiments, on a practical scale, will probably prove to be of some assistance.

The metal, which the malleable founder pours into moulds, is a white cast iron, which for blackheart castings usually conforms to an analysis of T.C 2.3 to 2.5 per cent., Si 0.90 to 1.0 per cent., Mn 0.3 to 0.4 per cent., S 0.07 to 0.09 per cent. and P 0.15 per cent. maximum, and in the author's foundries is provided from air furnaces, either hand-fired, of 7 tons capacity, or pulverised-coal-fired of 20 tons capacity. Such an iron must be cast at a high temperature, approximately 1,450 deg. C., and it has a high initial freezing point, a freezing range longer than steel and shorter than cast iron and high solid contraction, all

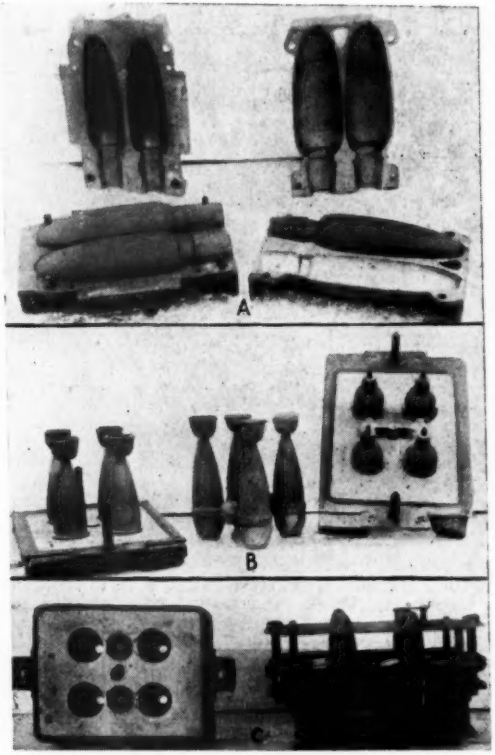

FIG. 7A.—COREBOX, CORE DRIER AND CORES FOR 3-IN. MORTAR BOMBS.

FIG. 7B.—TWIN PATTERN PLATES FOR 3-IN. MORTAR BOMBS AND CASTINGS, WITH FEEDERS AND RUNNERS ATTACHED.

FIG. 7C.—COPE AND DRAG, SHOWING JIG AND BRIDGE GAUGE USED IN SETTING CORES FOR MORTAR BOMBS.

Malleable Iron Castings

of which create problems for the foundryman. Another complication, too, is that all the metal is of one composition, except for the changes which take place in the bath of metal during the time the furnace is running out (it may be as much as ½ to 1 hr. for a 20-ton heat), and this means that all types of castings, thick and thin, large and small, are cast

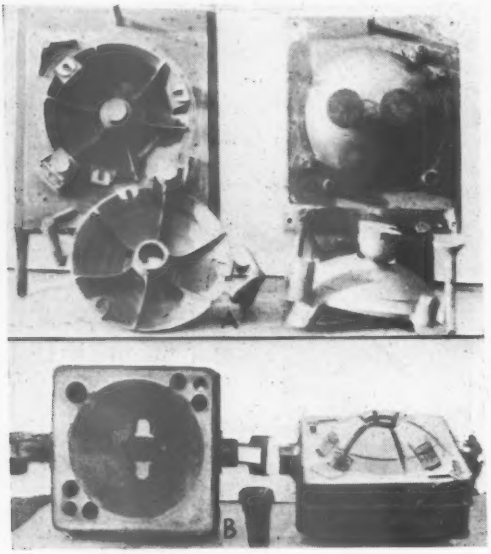

FIG. 8A.—TWIN PATTERN PLATES FOR 21-IN. TORPEDO NOSE, TOGETHER WITH CASTINGS, WITH FEEDERS AND RUNNERS ATTACHED.

FIG. 8B.—COPE AND DRAG FOR 21-IN. TORPEDO NOSE CASTING.

with the same metal, although some selection can be, and is, made.

The use of blind feeders has long been in vogue with the malleable founder, and such feeders have been utilised by the author's company for 15 or 20 years. However, three years ago, the author conducted a special investigation on the feeding of malleable-iron castings, and since then the results obtained have been used on a practical scale. Like Taylor and Rominski, the author obviously selected a spherical-shaped feeder, as it had the least surface area for a given volume, with consequent less dissipation of heat, and it was from this fundamental basis that the author developed his subsequent practical applications. At the same time, the author's main intention was to endeavour to increase the yield of good castings from the melt by reducing the amount of metal used for feeders, and, in this, he claims some measure of success, although he had in mind at the same time the greater effectiveness of such feeders.

It was evident that, in the past, experience or 'rule-of-thumb' had been the usual guide in the choice of a shape or size of feeder, or of its disposition.

FIG. 9A.—JOLT-SQUEEZE STRIPPER MACHINE, WITH COPE AND DRAG SHOWN FOR TANK CARRIER PLATE.

Even to-day experience is the ruling principle, but greater thought is now given to each individual casting in a definite attempt to reduce the amount of feed metal and also to improve feeding. On the other hand, it is unwise to 'skimp' feeders too much, because allowance must be made for variations in temperature of casting and of composition of metal. There is still no formula established to enable one to calculate the size of feeders required on any particular casting, but, as savings have definitely been registered, the investigations have justified themselves.

The fundamentals of good foundry practice can be applied to the manufacture of all castings, be they made in steel, non-ferrous, white cast iron or other metals, but each type of metal used presents its own peculiarities to the founder in the actual manufacture

of the casting. The gating and feeding of malleable castings offers an opportunity to the founder to overcome problems which have been present ever since the manufacture of malleable castings was introduced.

Gating Malleable Castings

The author has derived a great deal of pleasure and useful information from the perusal of a Paper entitled "Gating Malleable and ArmaSteel Castings[4]," by F. E. Reeves, who in an admirable contribution

FIG. 9B.—JOLT-SQUEEZE STRIPPER MACHINE, SHOWING MOULD "PUSHED OFF."

to literature describes different methods of gating and feeding used in his foundry, and changes that have been made to reduce the total per cent. of scrap.

The gating of malleable castings is a matter which demands great attention to detail. It should be emphasised that white cast iron should be melted under proper conditions, and should carry such superheat as to enable the foundryman to distribute and handle the metal for successful casting. Hand ladles of 60-lb. capacity, filled direct from the furnace and bogies, carrying 6-cwt. of metal, subsequently transferred into hand ladles or shanks, and shanks of 1¼-cwt. capacity, are used in the distribution and casting of the metal. The casting temperature of white cast iron is most important as, on the one hand, if on the low side, there is the danger of 'misrun' castings, whilst on the other hand, if too high, greater liquid shrinkage ensues, due to heating up of the mould.

In arranging the gating of any casting, it should be borne in mind that the metal should enter the mould in a manner to cause least disturbance or turbulence, and with speedy pouring to fill the mould as quickly as possible. Reeves has found that ". . . most slag is formed in the mould . . . " and ". . . the greater the disturbance of the iron, the more slag will be formed. . . ."

Many devices are resorted to in an endeavour to ensure that the iron before entering the mould is clean and free from slag, but, despite this, slag occasionally makes its appearance in the casting. A strainer bush, or grid, at the top of the downgate with a grid at the bottom of the downgate is one method used. The grids should be made from a special mixture of oil sand to produce a hard and rigid core, which will not wash or break, for, if fracture or erosion occurs, the sand is taken into the mould. As an alternative

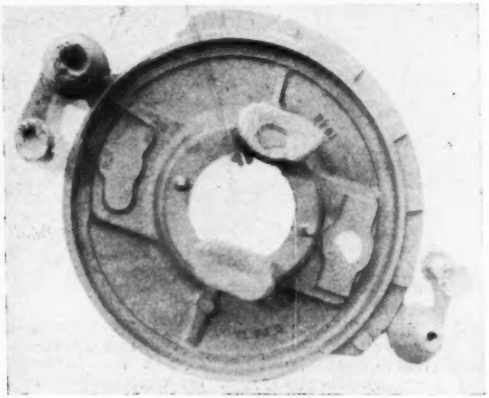

FIG. 9C.—TANK CARRIER PLATE CASTING, WITH FEEDERS AND RUNNERS ATTACHED.

to this the 'grid' may be placed on its side, so that it stands up vertically in the runner between the downgate and the casting. The metal, in this way, passes through the grid as opposed to dropping on to it, thus lessening the danger of breakage. 'Spin gates' or 'spinners' are made use of, and gates, where possible, are partly cut in the cope so that any dross may rise to the top of them, so that clean metal only may enter the mould. Sometimes a back runner is incorporated in the gate so as to impart a spin to the metal.

The time taken for pouring different moulds has been observed, and improved results have been obtained by altering the speed of running. The gating of any casting must also be considered at the same time as provisions are made for 'feeding.' Where possible metal is run into the 'feeder,' which is attached to the casting. With some castings, it is

Malleable Iron Castings

only possible to convey the metal into the mould through 'V gits,' and in these cases the feeders must be located on the castings above these 'gits,' or near them, in order that the castings may be sound, where the 'gits' join the casting. Naturally, a hot spot occurs where the metal enters the mould and 'feed metal' must be made available.

(*To be continued.*)

FIG. 10A.—DRAG, WITH CORE IN POSITION, AND COPE, READY FOR TURNING OVER, FOR THREE-TON LORRY AXLE HOUSING. IN THE BACKGROUND, MOULDS READY ON CONVEYOR FOR CASTING.

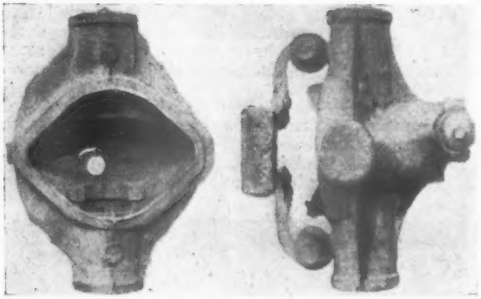

FIG. 10B.—TWO VIEWS OF AXLE HOUSING, WITH FEEDERS AND RUNNERS ATTACHED.

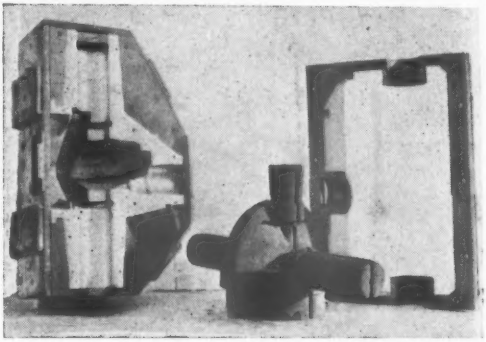

FIG. 10C.—COREBOX, CORE JIG AND TWO HALF-CORES FOR AXLE HOUSING.

BLACK FINISHES FOR FERROUS AND NON-FERROUS PARTS

A variety of war production items of brass and copper, zinc, cast iron and steel are being black finished by the Oxidine finishes and Jetal process of the Alrose Chemical Company, Cranston, R.I., U.S.A. Oxidine B is an adhering hard black usable on alloys such as brass and electroplated copper and brass. No special equipment is needed; the salts are merely added to water, heated to 200 deg. F. and the black is obtained by immersion in the bath for 3 to 15 min., depending on the alloy. Work can be handled in bulk. Oxidine B is used for blackening and protection of instruments, optical goods, ordnance parts, and many other applications.

For zinc, Oxidine Z is recommended. It is satisfactorily used on zinc die castings and electroplated zinc. Only simple equipment is required, the process calling for the addition of the salts to water, heating to boiling point and immersion of the objects from ½ to 2 min.

On cast iron, Oxidine CI provides an inexpensive and simple method of obtaining a dense black finish at low temperature. The salts are added to water and heated to 212 deg. F., after which the cast-iron parts are immersed for 5 to 10 min. No special cleaners are required, and the application can be made to a great variety of cast-iron parts with equal speed and facility.

For steel, the Jetal process produces a deep penetrating black by a 5 to 10 min. immersion in a bath prepared by adding the salts to water and heating to 285 deg. F. When the Jetal process is applied as an after finish, the surfaces so treated will withstand 25 to 300 hrs. of salt spray by test, depending on the oil used.—"The Iron Age."

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Refined PIG IRON for High Duty

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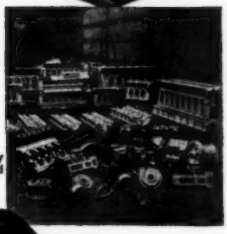
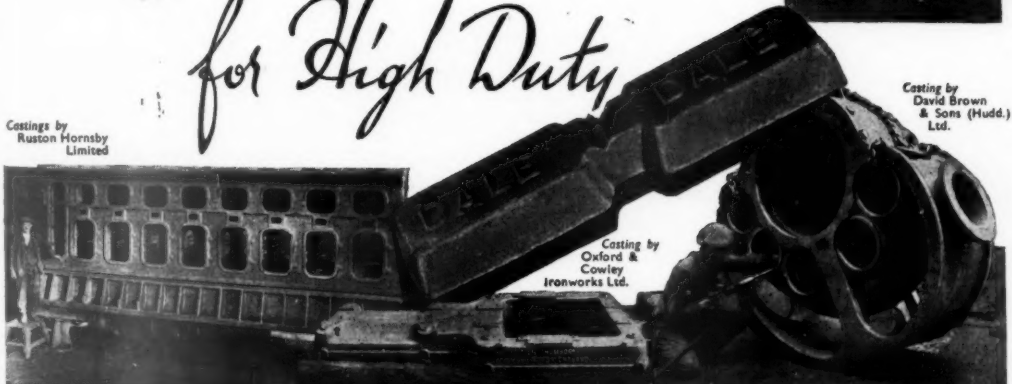
Casting by Baker Perkins Limited



Castings by Ruston Hornsby Limited



Castings by Ruston Hornsby Limited

Casting by David Brown & Sons (Hudd.) Ltd.

Casting by Oxford & Cowley Ironworks Ltd.

THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

554,229 GERBER, J. S., and REDFERN, W. D. Method of, and means for, stirring or circulating molten materials or mediums.

554,247 FREYN ENGINEERING COMPANY. Blast furnaces.

554,264 CARNEGIE-ILLINOIS STEEL CORPORATION. Guiding devices for use in the manufacture of sheet or strip metal.

554,277 TRIGGS, W. W. (Carnegie-Illinois Steel Corporation). Automatic regulation of current in electroplating bath.

554,288 BURGER, G. Mould for casting chains.

554,310 SMITH, S. Means for forming an eye or loop in multi-strand wire ropes or cables.

554,340-1 PROTECTIVE METAL FINISHES, LIMITED, and BERGSTEIN, G. K. Metallic coating of articles.

554,348 PYRENE COMPANY, LIMITED. Ferrous sheets for fabricating into cans.

554,352 EVERY, C. E. (Titanium Alloy Manufacturing Company). Welding rods for use in welding chromium steels and the welds obtained therewith.

554,413 LANDAU, B. Process for the manufacture of castings of metal carbides.

554,512 BRITISH THOMSON-HOUSTON COMPANY, LIMITED, and RANDLES, W. A. Pipe joints and the like.

554,520 TRIGGS, W. W. (Carnegie-Illinois Steel Corporation). Methods and apparatus for handling strip metals.

554,543 GROVES, W. W. (Moore, W. E.). Electrode holders for electric arc furnaces.

554,545 BRITISH THOMSON-HOUSTON COMPANY, LIMITED. (General Electric Company). Joining beryllium to other metals by fusion, particularly for X-ray apparatus.

554,562 BENNIE, J. Composite sheet material.

554,571 PERMOLD COMPANY. Permanent moulds for casting substantially cylindrical metal pistons.

554,635 BRAIN, L. E. Method of preparing metal sheets for welding and of welding such sheets together.

554,654 ABBEY, A. (American Chemical Paint Company). Production of phosphate coatings upon ferrous metal surfaces.

554,676 ELECTRIC RESISTANCE FURNACE COMPANY, LIMITED, and MONKS, J. A. Heat-treatment of metallic material or articles.

554,685 WEBB, G. W., and PROCTOR, W. F. Method of and means for melting metals and other mouldable substances.

554,725 ELECTRIC RESISTANCE FURNACE COMPANY, LIMITED, MILLAR, W. J., and MONKS, J. A. Furnaces for continuous heat-treatment.

554,726 ELECTRIC RESISTANCE FURNACE COMPANY, LIMITED, and MILLAR, W. J. Furnaces for heating metals and the like.

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"PORTAWAY." — Electrical conductors. FRANK PORTER, 8, Portsdown Road, Stoneygate, Leicester.

"RED GAP"—Heating and cooking stoves and ranges. FRANK AIKEN, Sandyford, County Dublin, Eire.

"UNIVERA"—Engineers' jibs, locating devices, etc. BRITISH EAGLE INDUSTRIES, LIMITED, Eagle Works, Duke Street, Birmingham.

"SILON"—Electric wire, cables, connections, etc. F. D. SIMS, LIMITED, Hazelhurst Works, Regent Street, Ramsbottom, Lancs.

"MARTINDALE" — Commutator grinding stones. MARTINDALE ELECTRIC COMPANY, LIMITED, Westmorland Road, London, N.W.9.

"BAXI"—Fireplaces and firegrates. JOHN BAXENDALE and RICHARD BAXENDALE, Albert Street Foundry, Albert Street, Chorley, Lancs.

"FUZIT"—Electrical apparatus, hand tools, etc. STANDARD TELEPHONES & CABLES, LIMITED, Connaught house, 63, Aldwych, London, W.C.2.

"FLORYT"—Metal chains; chain cables. NORTH BRITISH ELECTRIC WELDING COMPANY, LIMITED, Tennant Street, Whifflet, Coatbridge.

"DOUGLAS"—Petrol-electric generators, internal combustion engines (stationary), aircraft and ships engines. AERO ENGINES, LIMITED, Kingswood, Bristol.

"COMET"—Engineers' jigs, electric arc-welding apparatus, etc. CHARLES CHURCHILL & COMPANY, LIMITED, Walnut Tree Walk, Kennington, London, S.E.11.

"CONCORDIA"—Electric batteries, accumulators, transformers, condensers, etc. CONCORDIA ELECTRIC SAFETY LAMP COMPANY, LIMITED, Luma Works, Sanatorium Road, Cardiff.

"SILVERSTAT"—Electric voltage and current regulators. WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY, c/o G. Raymond Shepherd, 2, Norfolk Street, Strand, London, W.C.2.

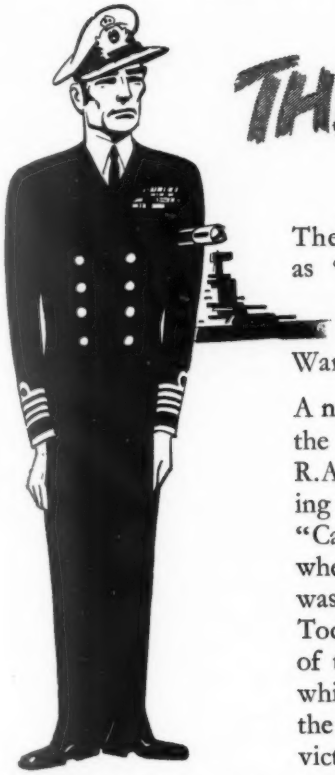
[*Application to the Cutlers' Company, Sheffield.*]

"FIREX"—Steel and tools. DARWINS, LIMITED, Fitzwilliam Works, Templeborough, Sheffield.

AFRICAN MALLEABLE FOUNDRIES

African Malleable Foundries, Limited, which is at present erecting a foundry at Benoni, is a new enterprise of the Anglo-American Corporation of South Africa. It will be the first malleable-iron foundry in the Union and will be equipped to manufacture all classes of malleable iron and other castings. There is difficulty in obtaining building materials and machinery, but a large part of the plant has now been delivered, and it is hoped to bring the factory to production in the course of this year.

The Corporation has also established a new zinc products factory at Benoni for the manufacture of zinc dust, and this has been in operation since the beginning of January.



THE NAVY'S HERE!

The CAPTAIN, generally known as "The Owner," is the supreme authority in a warship, and has his own quarters, visiting the Wardroom only by invitation.

A naval Captain ranks with a Colonel in the Army or a Group-Captain in the R.A.F., and is the highest officer holding an individual command. The name "Captain" dates back to Roman times, when the officer in charge of Marines was called "Caput," i.e. The Head. Today these Sea-Captains devise some of the strategy and most of the tactics which are inexorably wearing down the Axis. Their task can be eased and victory hastened by the salvaging of all available SCRAP to help supply the Navy's ever-urgent demand for steel.

Every ton of SCRAP we purchase is sent with all possible speed to the Steelworks which will convert it into a Pain for Hitler—Ships or Guns or Tanks or Shells or Bombs . . .

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"We need more SCRAP to make more steel
For bombs and shells and guns and keel.
If you supply the SCRAP we need
We'll win this war with greater speed.
. . . for every ton will hit the Hun!"

GEORGE COHEN *Sons & Co. Ltd.*

Scrap Merchants since 1834 · Broadway Chambers, Hammersmith, London, W.6 (*Riverside* 4141) · Quadrant Street, Canning Town, E.16 (*Albert Dock* 3104) · 600 Commercial Road, E.14 (*Stepney Green* 3434). And at: Sheffield, Birmingham, Manchester, Newcastle, Belfast, etc.

ONE OF THE 600 GROUP OF COMPANIES

NEWS IN BRIEF

ON JULY 31, the official cost of living index figure was 99 points above the level of July, 1914, compared with 100 points on July 1.

THE WROUGHT LIGHT ALLOYS DEVELOPMENT ASSOCIATION now has its offices at Union Chambers, 63, Temple Row, Birmingham, 2.

IRISH STEEL, LIMITED, Haulbowline, Co. Cork, expect to be in a position to make deliveries of steel for general purposes in about three months' time.

BY MEANS of a mobile exhibition which has begun a tour of the West and East Ridings, workers in non-ferrous metals are being given an opportunity to see some of the finished war weapons of which the components they make form a vital part.

ACCORDING TO a message from Washington, the Anglo-American mission headed by Sir John Duncanson has completed its tour of investigation of the steel-producing capacity of the Allies and of Australia in particular. The tour lasted three months, during which the mission covered 48,000 miles. The mission is understood to have submitted its report to the Governments concerned.

WHOLESALE PRICES in July, as measured by the Board of Trade index number, showed a rise of 0.5 per cent. compared with June food prices rising seasonally by 1.7 per cent. and industrial materials falling by 0.1 per cent. Compared with August, 1939, the aggregate increases were:—General index 67 per cent., food and tobacco 82 per cent., and industrial materials and manufactures 60 per cent.

THE SELECT COMMITTEE on National Expenditure, in a report on aircraft production published by the Stationery Office (4d. net), affirms that there are not enough adequately qualified men available to maintain the aeronautical industry in this country at the proper level of efficiency. Special measures are therefore necessary. Men of high academic, scientific, or technical attainments should not be allowed to be absorbed in the fighting services, the Committee states. More pre- and post-graduate courses in aeronautics are needed at the Universities.

ARMSTRONG WHITWORTH SECURITIES COMPANY, LIMITED, is to be voluntarily wound up. The directors consider that the time has arrived when the company should be put into liquidation so that the liquidator can take steps to realise the holding in the Pearson & Knowles Coal & Iron Company, Limited, and thereafter proceed to make a distribution to shareholders of the surplus assets. Following the sale of Scotswood Works in 1937, engineering operations to all intents and purposes came to an end. Since that time the directors have given their main attention to the clearing up of all outstanding contractual obligations and the realisation of investment assets. This policy, it is stated, has now been practically achieved and, with the exception of the investment in the Pearson & Knowles Company and Armstrong Whitworth (Vehicle Services), Limited, the balance-sheet now discloses a liquid position.

OBITUARY

COL. CLARENCE I. A. DUBS, a director of the North British Locomotive Company, Limited, has died at Maybole, Ayrshire, aged 51.

MR. HARRY BLATHERWICK, senior director of the Kiveton Park Steel & Wire Works, Limited, has died at his home in Sheffield, aged 58.

MR. CROSSLAND BRAITHWAITE, chairman of H. Braithwaite & Company, Limited, engineers and coppersmiths, Leeds, has died, aged 77.

PROF. F. BACON, who had occupied the Chair of Engineering at University College, Swansea, since 1920, died at Newbury last week in his 63rd year.

MR. ALFRED WALTER JOHNSON has died at the age of 54. He was chairman of E. S. Johnson & Company, Limited, iron and steel stockholders, of Newcastle-upon-Tyne, and of the Iron and Steel Stockholders' Association for the north-east area.

MR. ERNEST GARIBALDI MARTYN, a director of the old-established firm of Oatey & Martyn, Limited, engineers, iron and brass founders, etc., of Wadebridge, Cornwall, has died, aged 82. He commenced his connection with the firm at the age of 16, and retired five years ago on account of ill-health.

MR. CHARLES BRYERS, managing director of John Crown & Sons, Limited, shipbuilders, has died at Sunderland at the age of 69. Mr. Bryers was vice-president of the Society of Consulting Engineers and Ship Surveyors, and a member of the North-East Coast Institution of Engineers and Shipbuilders and of the Wear Shipbuilders' Association.

MR. JAMES BOYD SHIELD, late joint managing director of Anderson, Boyes & Company, Limited, mining machinery manufacturers, Motherwell, has died at his home in Edinburgh, at the age of 67. Mr. Shield, who was a native of Arbroath, joined the firm of Anderson, Boyes & Company in 1907, retiring from active participation in the business in 1933.

PERSONAL

MR. J. G. BRADLEY, of Morris Engines, Coventry, has been appointed an assistant general manager of Baldwins, Limited, as from October 1 next, and will be in charge of their light alloy section in South Wales.

MR. W. D. KING, a director of Richmonds Gas Stove Company, Limited, has also joined the board of Fletcher Russell & Company, Limited, and succeeds the late Mr. C. G. Langford as general manager at Warrington, Lancs.

MAJOR-GENERAL SIR BASIL HILL has been appointed to be Director of Hand Tools, Ministry of Supply, in place of Mr. G. Clement Jenks, who has for personal reasons resigned the appointment. Mr. Jenks will continue to assist the Ministry in a technical advisory capacity. Sir Basil Hill was formerly Controller of Ordnance Services at the War Office.

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COMPANY RESULTS

(Figures for previous year in brackets)

Davis & Timmins—Interim dividend of 10% (same).

John Oakey & Sons—Interim dividend of 2½% (same).

Light Production—Final dividend of 15%, making 25%, plus a bonus of 5% (same).

Brightside Foundry & Engineering—Ordinary dividend of 1s. 9d. per 5s. share, equivalent to 35% (25%).

Berry's Electric—Net profit for the year ended March 31, £32,173 (£18,490); dividend of 10% (6%); forward, £3,589 (£3,163).

Geevor Tin Mines—Net profit for the year to March 31 last, £24,019 (£13,830); final dividend of 7½% (12½%), making 15% (12½%).

Larmuth & Bulmer—Profit for year to March 31, after taxation and depreciation, £3,732 (£3,566); final ordinary dividend of 7½%, making 10% (same); forward, £4,138 (£4,539).

Tungsten Manufacturing—Profit to September 30, 1942, £6,726; depreciation, £607; to taxation reserve, £4,250; half-year's preference dividend to March 31, 1933, £569; forward, £2,220.

Metropolitan Electric Cable & Construction—Net profit for 1942, £34,626; taxation, £18,655; preference dividend, £2,475; to preference share reserve, £10,000; ordinary dividend of 7½%; forward, £2,969 (£3,973).

Trianco—Net profit for 1942, £33,577 (£30,911); reserve for taxation, £27,000 (£17,500); ordinary dividend of 10% (same), and participating dividend on the preference shares of 1% (same); forward, £9,472 (£9,270).

Engineering & Lighting Equipment—Net profit for the year to March 31, £23,231 (£23,006); redemption fund, £7,402 (£6,700); final dividend on the ordinary shares of 6%, making 10% (same); forward, £4,141 (£4,611).

Aeroplane & Motor Aluminium Castings—Net profit to March 31, 1942, after E.P.T., £12,131 (£12,471); to depreciation, £19,336 (£21,896); income-tax, £12,500 (£18,500); ordinary dividend of 10% (15%), £5,000 (£7,500); forward, £16,192 (£14,356).

Richardsons, Westgarth—Profit for the year ended March 31, 1943, after providing for depreciation, debenture stock sinking fund, and taxation, £44,411 (£35,402); dividend of 8% (same), £35,387; to general reserve, £100,000; forward, £34,463 (£125,439).

Armstrong Whitworth Securities—Company is to be wound up voluntarily. Accounts for 15 months to March 31 show dividends and interest on investments and bank deposits £11,408 (£7,243 previous 12 months); administrative charges, £2,375 (£1,940); tax, £4,657 (£2,725); net income, £4,657 (£2,725); forward, £28,846.

James Howden—Profit for the year ended April 30, £138,937 (£114,762); interest, £8,460 (£9,353); depreciation, £21,000 (£19,954); war damage insurance, £3,547 (£3,057); taxation, £73,000 (£52,000); net profit, £31,530 (£28,998); to general reserve, £10,000 (same); dividend of 1s. 6d. per share on the ordinary shares, £17,850 (same); forward, £22,874 (£19,194).

Zinc Corporation—Final participating dividend of 1s. per share (English currency) out of the profits for 1942, on both the preference and ordinary shares, making the total distribution for the year 6s. per share on the preference and 2s. per share on the ordinary shares; also 2s. per share (English currency) on the preference shares, being the first half of the fixed preferential dividend for 1943.

Head, Wrightson—Full report shows: Trading profit for year ended April 30, after A.R.P. expenditure, etc., and war damage insurance, £197,517 (£183,892); interest on debentures, £6,750 (same); taxation, £140,000 (£126,000); depreciation, £30,000 (same); net balance, £21,093 (£20,929); to reserve for general purposes, £4,970 (nil); final dividend on the ordinary shares of 3½%, making 6% (same); forward, £29,247 (£27,648).

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Metals & Alloys (Birmingham), 307, High Street, West Bromwich, Staffs—£1,000.

J. D. & M. Heslop, 3, Bristol Mews, Maida Vale, London, W.9—Engineers. £1,000.

Kirkgate Engineering—£1,000. A. E. Barton, 17, Ashville Grove, Leeds, 6, subscriber.

Whitmarley Engineering Company, 10, John Street, Bristol—£1,000. A. C. Whitehorn, H. Lee, and W. L. Martin.

W. H. Bristow & Son, 12, Sampton Street, Wapping, London, E.1—Profilers, electric welders, etc. £1,000. W. H. and R. H. Bristow.

Mills Ellis, 10, Old Square, Lincolns Inn, London, W.C.2—Toolmakers, engineers, etc. £1,000. J. E. Cammell and W. R. Francis.

Tattersall & Sons, 137, Southfield Road, Middlesbrough—Refractory and general contractors and engineers. £3,000. N. and W. Tattersall.

G. H. Rigby & Son, Sankey Bridge, Liverpool Road, Warrington—To take over the business of welders and engineers carried on at 308, Manchester Road, Warrington, as "Empire Welding Company." £5,000. G. H. and G. Rigby.

THE IRON AND STEEL TRADES CONFERENCE is to press strongly on the Government the view that the iron and steel industry should come under public ownership and control. During the last few weeks the Confederation has been holding conferences of its members up and down the country. The demand for public ownership was voiced at each meeting, and the Executive Council has sent the demand on to the Government. The Confederation, according to Mr. John Brown, its general secretary, does not take the view that the change must be left until after the war, but that it must at least be an essential in post-war reconstruction.

MINISTRY OF SUPPLY

PRACTICALLY ONE-THIRD OF ALL GIANT TYRES

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and, consequently, only fit for scrap

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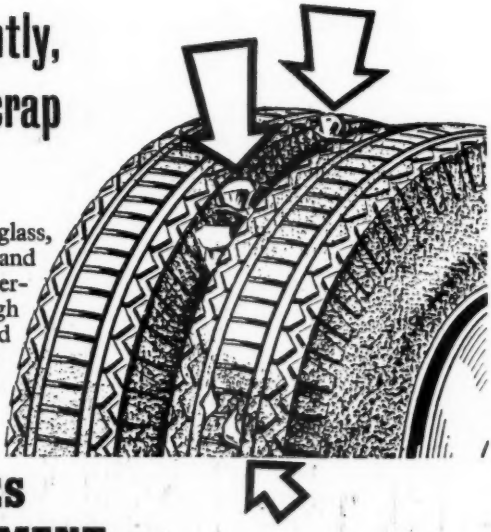
Look for embedded flints, glass, nails, etc., in *your* tyres and dig them out at once. Otherwise they will work through the tread into the casing and destroy a tyre that *might* have been saved for retreading.



SUBMIT TYRES FOR REPLACEMENT WHEN SMOOTH

Raw Material Markets

IRON AND STEEL

Apart from the steel plants, whose pig-iron requirements are amply covered by the associated blast furnaces, the heavy engineering and allied foundries are the heaviest consumers of pig-iron, and while these establishments are not always able to obtain the particular qualities required, their aggregate needs are well cared for. The allocations of low-phosphorus iron for September are on a better scale, and good supplies of refined iron and steel scrap are coming forward.

Some time ago the authorities called a halt in the plans made for the concentration of the light-foundry trade, and it was hoped that this was to be the prelude to an accession of business in this section. As things have turned out, however, there has been very little improvement and for the most part makers of light castings have not sufficient work on hand or in prospect to justify full-scale operations. It is true that a number of foundrymen who normally produce small castings have been able to adapt their resources to the manufacture of the heavier products required by Government departments and other high-priority buyers, but the bulk of the trade is dependent on orders for rainwater goods, etc., for the building industry, and these are not at all plentiful at the present time. With the cessation of hostilities, of course, it is to be expected that there will be a very substantial demand for castings of this nature, but until then it would seem that there will be little scope for light foundries. Heavy engineering and allied foundries, on the other hand, are likely to remain very briskly employed for the duration of the war, as all along there has been a large call for their manufactures in connection with the production of munitions, armaments, etc.

The deliveries of semis to the re-rolling plants reflect a continuous expansion of home production. Relatively little imported material is at present being used, but re-rollers still find it necessary to take up any available tonnages of defective billets, double-sawn crops, etc. All the light mills are working to capacity and are assured of full employment to the end of the year. A big proportion of the output of the heavy-steel mills is required by the shipbuilding, marine engineering and boiler-making trades, but armaments requirements of all kinds also call for sustained effort. Heavy plates and large bars are rarely obtainable against new contracts earlier than the first period of next year, and those sheet-makers who are not diverted to the rolling of light-steel plates are heavily pressed for black sheets, which are in demand for a wide variety of purposes. The sheet mills have been helping considerably in recent months by the rolling of thick sheets. Special sheets, cold-rolled strip and bright-drawn steel bars are wanted by engineering firms engaged on munitions, armament and aircraft construction and heavy tonnages are on hand at the works which will take some months to overtake.

NON-FERROUS METALS

Still larger quantities of secondary copper are being utilised in this country, with the result that imports of virgin metal are less than would otherwise have been the case. This is a particularly important factor in view of the very heavy demands now being made upon shipping space for various purposes. Priority consumers of copper are receiving all the metal they require and there is no reason to believe that there will be any shortage in the future. Consumption has been drastically curtailed among non-essential users, while the utmost economy is being encouraged among high-priority buyers.

While there is certainly no tin to spare after urgent demands have been satisfied, the position at present is very much better than might have been anticipated some time ago. The Japanese conquests in Malaya and the Dutch East Indies deprived the United Nations of the bulk of their tin resources, but the situation was tackled in a realistic way and consumption was curtailed at every opportunity. Many means have been found for utilising other materials in place of tin and this policy has been more successful than many had imagined would be the case. It is perhaps some consolation to know that the Japanese are not benefiting to the full from their conquest of the Eastern tinfields, owing to an acute shortage of shipping, while the British blockade is preventing Germany from improving her desperate tin position.

Ample tonnages of lead are on hand to satisfy priority needs and, in fact, the supply position is relatively easy, but the Control are still determined to prevent the metal being utilised for other than essential uses except in special circumstances.

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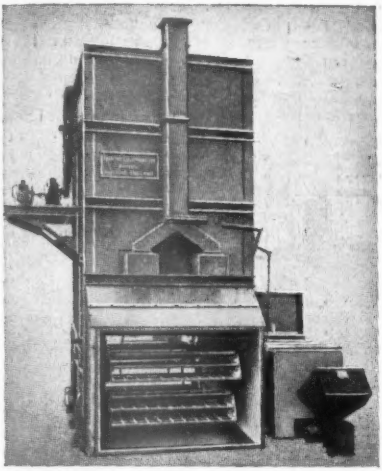

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CURRENT PRICES OF IRON, STEEL AND NON-FERROUS METALS

(Delivered, unless otherwise stated)

Wednesday, September 1, 1943

PIG-IRON

Foundry Iron.—CLEVELAND No. 3: Middlesbrough, 128s.; Birmingham, 130s.; Falkirk, 128s.; Glasgow, 131s.; Manchester, 133s. DERBYSHIRE No. 3: Birmingham, 130s.; Manchester, 133s.; Sheffield, 127s. 6d. NORTHANTS No. 3: Birmingham, 127s. 6d.; Manchester, 131s. 6d. STAFFS No. 3: Birmingham, 130s.; Manchester, 133s. LINCOLNSHIRE No. 3: Sheffield, 127s. 6d.; Birmingham, 130s.

(*No. 1 foundry 3s. above No. 3. No. 4 forge 1s. below No. 3 for foundries, 3s. below for ironworks.*)

Hematite.—No. 1 (S & P 0.03 to 0.05 per cent.): Scotland, N.-E. Coast and West Coast of England, 138s. 6d.; Sheffield, 144s.; Birmingham, 150s.; Wales (Welsh iron), 134s. East Coast No. 3 at Birmingham, 149s.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, 140s. 6d., delivered Birmingham.

Scotch Iron.—No. 3 foundry, 124s. 9d.; No. 1 foundry, 127s. 3d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, 174s.; South Zone, 176s. 6d.

Refined Malleable.—North Zone, 184s.; South Zone, 186s. 6d.

Cold Blast.—South Staffs, 227s. 6d.

(NOTE.—*Prices of hematite pig-iron, and of foundry and forge iron with a phosphoric content of not less than 0.75 per cent., are subject to a rebate of 5s. per ton.*)

FERRO-ALLOYS

(*Per ton unless otherwise stated, basis 2-ton lots, d/d Sheffield works.*)

Ferro-silicon (5-ton) lots.—25 per cent., £21 5s.; 45/50 per cent., £27 10s.; 75/80 per cent., £43.

Ferro-vanadium.—35/50 per cent., 15s. 6d. per lb. of V.

Ferro-molybdenum.—70/75 per cent., carbon-free, 6s. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, 1s. 3½d. lb.

Ferro-tungsten.—80/85 per cent., 9s. 8d. lb.

Tungsten Metal Powder.—98/99 per cent., 9s. 9½d. lb.

Ferro-chrome.—4/6 per cent. C, £59; max. 2 per cent. C, 1s. 6d. lb.; max. 1 per cent. C, 1s. 6½d. lb.; max. 0.5 per cent. C, 1s. 6¾d. lb.

Cobalt.—98/99 per cent., 8s. 9d. lb.

Metallic Chromium.—96/98 per cent., 4s. 5d. lb.

Ferro-manganese.—78/98 per cent., £18 10s.

Metallic Manganese.—94/96 per cent., carb.-free, 1s. 9d. lb.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms and Slabs.—BASIC: Soft, u.t., 100-ton lots, £12 5s.; tested, up to 0.25 per cent. C, £12 10s.; hard (0.42 to 0.60 per cent. C), £13 17s. 6d.; silico-manganese, £17 5s.; free-cutting, £14 10s. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £15 15s.; case-hardening, £16 12s. 6d.; silico-manganese, £17 5s.

Billets, Blooms and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £13 17s. 6d.; basic hard, 0.42 to 0.60 per cent. C, £14 10s. 6d.; acid, up to 0.25 per cent. C, £16 5s.

Sheet and Tinplate Bars.—£12 2s. 6d., 6-ton lots.

FINISHED STEEL

[*A rebate of 15s. per ton for steel bars, sections, plates, joists and hoops is obtainable in the home trade under certain conditions.*]

Plates and Sections.—Plates, ship (N.-E. Coast), £16 3s.; boiler plates (N.-E. Coast), £17 0s. 6d.; chequer plates (N.-E. Coast), £17 13s.; angles, over 4 un. ins., £15 8s.; tees, over 4 un. ins., £16 8s.; joists, 3 in. × 3 in. and up, £15 8s.

Bars, Sheets, etc.—Rounds and squares, 3 in. to 5½ in., £16 18s.; rounds, under 3 in. to ⅜ in. (untested), £17 12s.; flats, over 5 in. wide, £15 13s.; flats, 5 in. wide and under, £17 12s.; rails, heavy, f.o.t., £14 10s. 6d.; hoops, £18 7s.; black sheets, 24 g. (4-ton lots), £22 15s.; galvanised corrugated sheets (4-ton lots), £26 2s. 6d.; galvanised fencing wire, 8g. plain, £26 17s. 6d.

Tinplates.—I.C. cokes, 20 × 14 per box, 29s. 9d., f.o.t. makers' works, 30s. 9d., f.o.b.; C.W., 20×14, 27s. 9d., f.o.t., 28s. 6d., f.o.b.

NON-FERROUS METALS

Copper.—Electrolytic, £62; high-grade fire-refined, £61 10s.; fire-refined of not less than 99.7 per cent., £61; ditto, 99.2 per cent., £60 10s.; black hot-rolled wire rods, £65 10s.

Tin.—99 to under 99.75 per cent., £275; 99.75 to under 99.9 per cent., £276 10s.; min. 99.9 per cent., £278 10s.

Spelter.—G.O.B. (foreign) (duty paid), £25 15s.; ditto (domestic), £26 10s.; "Prime Western," £26 10s.; refined and electrolytic, £27 5s.; not less than 99.99 per cent., £28 15s.

Lead.—Good soft pig-lead (foreign) (duty paid), £25; ditto (Empire and domestic), £25; English, £26 10s.

Zinc Sheets, etc.—Sheets, 10g. and thicker, ex works, £37 12s. 6d.; rolled zinc (boiler plates), ex works, £35 12s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £30 10s.

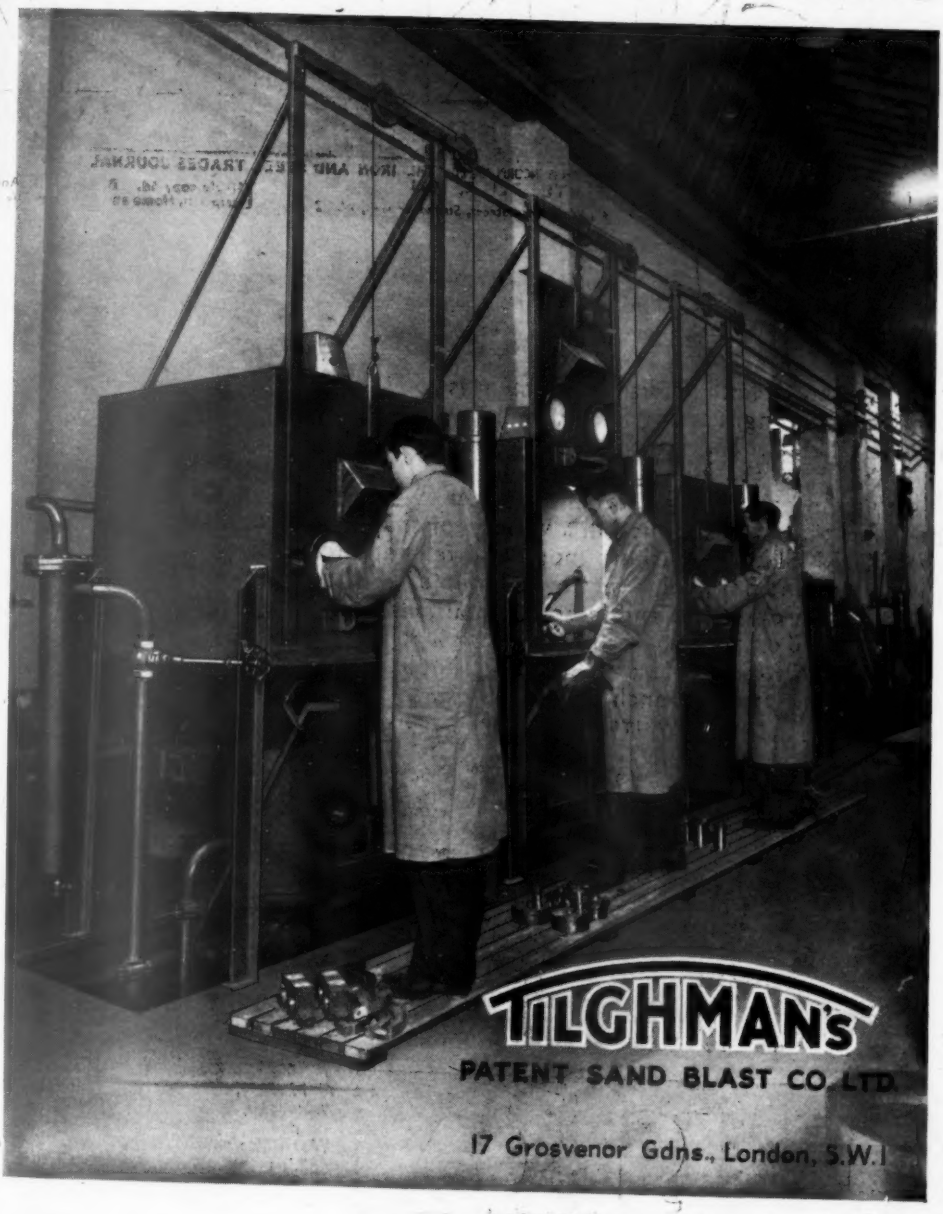
Other Metals.—Aluminium, ingots, £110; antimony, English, 99 per cent., £120; quicksilver, ex warehouse, £68 10s. to £69 15s.; nickel, £190 to £195.

Brass.—Solid-drawn tubes, 14d. per lb.; brazed tubes, 16d.; rods, drawn, 11¾d.; rods, extruded or rolled, 9d.; sheets to 10 w.g., 10¾d.; wire, 10¾d.; rolled metal, 10¼d.; yellow metal rods, 9d.

Copper Tubes, etc.—Solid-drawn tubes, 15¼d. per lb.; brazed tubes, 15¼d.; wire, 10d.

Phosphor Bronze.—Strip, 13¾d. per lb.; sheets to 10 w.g., 14¾d.; wire, 16d.; rods, 16d.; tubes, 21¼d.; castings, 19d., delivery 3 cwt. free. 10 per cent. phos. cop. £35 above B.S.; 15 per cent. phos. cop. £43 above B.S.; phosphor tin (5 per cent.) £40 above price of English ingots. (C. CLIFFORD & SON, LIMITED.)

Nickel Silver, etc.—Ingots for raising, 10d. to 1s. 4d. per lb.; rolled to 9 in. wide, 1s. 4d. to 1s. 10d.; to 12 in. wide, 1s. 4½d. to 1s. 10½d.; to 15 in. wide, 1s. 4½d. to 1s. 10½d.; to 18 in. wide, 1s. 5d. to 1s. 11d.; to 21 in. wide, 1s. 5½d. to 1s. 11½d.; to 25 in. wide, 1s. 6d. to 2s. Ingots for spoons and forks, 10d. to 1s. 6½d. Ingots rolled to spoon size, 1s. 1d. to 1s. 9½d. Wire round, to 10g., 1s. 7½d. to 2s. 2½d., with extras according to gauge. Special 5ths quality turning rods in straight lengths, 1s. 6½d. upwards.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